ABSTRACT

Objective: Evaluate achievement of the Stephanie Alexander Kitchen Garden Program in increasing child appreciation of diverse, healthy foods.

Design: Comparative 2-year study.

Setting: Six program and 6 comparison primary schools in rural and metropolitan Victoria, Australia, matched for socioeconomic status and size.

Participants: A total of 764 children in grades 3 to 6 (8–12 years of age) and 562 parents recruited. Retention rates at follow-up included 85% children and 75% parents.

Intervention: Each week of the school year, children spent 45 to 60 minutes in a garden class and 90 minutes in a kitchen class.

Phenomenon of interest: Program impact on children’s willingness to try new foods, capacity to describe foods, and healthy eating.

Analysis: Qualitative data analyzed using inductive thematic analysis. Quantitative data analyzed using random-effects linear regressions adjusted for school clustering.

Results: Child and parent qualitative and quantitative measures (if never tried before, odds ratio 2.0; confidence interval, 1.06–3.58) showed increases in children’s reported willingness to try new foods. No differences in articulation of food descriptions (program vs comparison groups). Qualitative evidence showed that the program extended its influence to healthy eating, but this was not reflected in the quantitative evidence.

Conclusions and Implications: Findings indicate program success in achieving its primary objective, meriting further program research.

Key Words: program evaluation, primary schools, cooking, gardening, child (J Nutr Educ Behav. 2013;45:137-146.)

INTRODUCTION

Food choice in humans is often determined by taste.1 Bitter and sour tastes are common in plant foods, consumption of which is highly desirable in a balanced diet. However, encouraging children to try these foods as a means of promoting diversity in diet and meeting nutritional recommendations is often problematic. Interventions aiming to increase children’s willingness to try new foods are generally education-based (ie, nutrition education with some tasting component),2,3 garden-based,4–6 or a combination of both.7,8 Nutrition education generally is composed of descriptions of foods and information regarding nutrition content. Reverdy and colleagues3 conducted taste classes and found a strong positive but temporary effect, which disappeared after 10 months, on willingness to try new foods. They concluded that extensive recurring exposure to new foods was required to achieve any lasting change to food preferences rather than cognitive education.

Kitchen garden programs are another mechanism through which children can be introduced to different foods. The nature and extent of existing kitchen garden programs vary; the main differences are related to whether there is a cooking component in the program and the amount of student involvement in the gardening and/or cooking activities. The descriptive terminology varies accordingly. For example, the “Edible Schoolyard” describes a seed-to-table program for grade 6 children from 2 schools in California,9 the “youth nutrition program” describes a nutrition education program conducted within...
South West Detroit, and the “school garden program” describes a garden-based program in an elementary school. For the purposes of this report, the term “edible garden” refers to programs that include active participation in developing and maintaining a garden with edible plants. The term “kitchen garden program” refers to programs that, in addition to a garden with edible plants, include participation in preparing and cooking meals in the kitchen-classroom using food harvested from the garden.

The increasing popularity of community-based kitchen garden programs has extended into the school setting, with widespread reports of school community benefits but limited evidence about impact and outcomes, particularly for programs with a dedicated cooking component. There are indications that cooking and gardening programs have positive outcomes such as engagement in the program activities, increased nutrition knowledge, increased ecocitizenship, as well as beneficial impacts of experiential learning. There are also some early indications that gardening and nutrition programs can increase willingness to taste vegetables or increase preference for vegetables. In a review article by Robinson-O’Brien et al., 3 of 11 garden program evaluations included willingness to taste vegetables or other foods as a measurement of change. The results of these 3 evaluations differed: 1 study reported increases in children’s willingness to taste fruits and vegetables, a second study reported increases for only vegetables, and a third found little evidence of an increase. More comprehensive and rigorous evaluations are required. The authors were unable to find other published studies that examined the impact of cooking classes or kitchen garden programs on willingness to try new foods.

This study provides a comprehensive evaluation of a school-based kitchen garden program: the Stephanie Alexander Kitchen Garden (SAKG) Program. The program model is embedded in the school curriculum and includes 45 min/wk in a garden class with a garden specialist and 90 min/wk in the kitchen with a cooking specialist. The program is designed to give children knowledge and skills in environmentally sustainable gardening. Children were actively involved in all aspects, from garden design, preparing beds, planting seeds, transplanting seedlings, nurturing the growing plants (including weeding, watering, fertilizing with homemade compost and “worm juice,” and applying organic pest control) to harvesting the yield. The cooking component of the program included teaching the children to safely wield sharp chef knives in preparing and cooking 3- or 4-course meals based on available fresh produce from the garden. Different dishes prepared each week included handmade pastry, bread, and pasta; salads; curries; and desserts. At the end of each kitchen class, the children, staff, and adult volunteers shared and enjoyed the multi-course meal that was prepared.

A primary outcome of the program and subsequently the program evaluation was children’s appreciation of a diverse range of foods, as indicated by an increased willingness to try new foods. A secondary outcome of the program and the evaluation was an increase in children’s capacity to describe foods, as a way of demonstrating food knowledge and sharing experiences and appreciation of food. This aspect of food appreciation, assessed in this evaluation, has not been explored in the kitchen garden literature despite its high profile in adult assessments of food and restaurants. Changing child dietary intake was not an outcome of the SAKG Program. Nevertheless, any increase in children’s willingness to try new foods would provide an opportunity to promote increased diversity and healthy eating in their diets. For this reason, the authors included assessment of healthy eating as a secondary outcome of the evaluation. Other components of the evaluation, including increased knowledge and economic, volunteer, and social impacts, will be reported elsewhere.

METHODS
Study Design

The SAKG Program was developed without specific reference to a theoretical model but the research team was able to identify multiple aligned theoretical frameworks of relevance in consultation with the SAKG Foundation. A social-ecological theoretical model and principles of effective health promotion informed the evaluation. Each recognizes the interdependence and impact of physical, social, and policy environments on individual behaviors and outcomes. Ozer’s social-ecological conceptual model suggests that exposure to fresh produce constitutes a proximal student-level effect of school gardens that in turn may be linked to distal effects such as an increased intake of fresh produce associated with reduced risk of obesity and chronic disease.

A nonrandomized, pre- and postcomparison study design was used to evaluate the impact of the SAKG Program over a 2.5-year period. A mixed methods approach was adopted to ensure the capacity of the evaluation to assess the feasibility, acceptability, and effect of the SAKG Program. The qualitative components of the evaluation provided an understanding of the experience and impact of the program on children, and their attitudes to food. The quantitative measures provided information about the extent of change occurring as a result of the SAKG Program. The rationale for this mixed-methods approach included the potential for triangulation, or corroboration of findings from evidence collected with different instruments and from different sources, as well as complementarity, in which results from 1 method are enhanced and clarified by combining with the other. Comparison also provides opportunities to reflect on and interpret findings from different methods and sources that are inconclusive or inconsistent. The Human Research Ethics Committees at the relevant universities and the State Government Department of Education reviewed and approved the project design.

Participants and Recruitment

The eligible sample of participants included all children in grades 3 to 6 from the 6 program and 6 comparison schools, a representative parent or guardian for each participating child, as well as all principals, specialist kitchen and garden staff, volunteer adults who assist in the kitchen and
garden classes, and classroom teachers who are responsible for supervising the children during the program classes.

The sample size calculation for the quantitative measures was based on detecting a mean difference of 0.5 of a standard deviation (effect size) between the program and comparison groups on continuous measures with 80% power at the 5% level of significance. A trial in which individual participants are allocated would require 63 children (and their parents) in each trial group. As clusters (schools) were allocated here, this sample size was inflated by the design effect [Design effect = 1 + (n - 1) Intra-cluster correlation coefficient], where n, the number of children sampled from each school, was assumed to be 40 and the intra-cluster (intra-school) correlation coefficient for the outcome was assumed to be 0.05. The design effect was then 2.95 and each trial arm required at least 186 children drawn from 5 schools under the inflated calculation. Adding an extra cluster to each arm to allow for inefficiency resulting from imbalance in the number of children recruited from each school, the aim was to recruit 240 children drawn from 6 schools in each trial arm.

The 21 SAKG Program schools operating at the time in Victoria, Australia, were stratified and 6 were selected to represent a range of characteristics in terms of geographic location (metropolitan and rural), school size (small, medium, and large), and socioeconomic status (represented by the percentage of school families receiving the government Education Maintenance Allowance). Six comparison schools were then individually matched according to the same criteria. At the beginning of the study, 5 of the 6 comparison schools had their own edible gardens; by the end, the sixth school also had an edible garden. In most of these cases, gardening was offered on an ad hoc basis, depending on the interests of children or teachers. One of the comparison schools, however, moved over the course of the evaluation from using their garden produce for occasional cooking to developing their own structured cooking program, in which all children participated once or twice per term. Thus, many of the children in the comparison schools participated in gardening (and some cooking) activities, although for substantially fewer hours and in a less structured way than in the program schools. This means that the evaluation needed to establish an impact of the SAKG Program model beyond any of these alternative activities rather than compared with schools with no cooking or gardening pursuits.

Participation in the evaluation was through a voluntary recruitment process in which all eligible staff and families were sent information letters and consent forms via the school and requested to return consent forms to the school for the research team to collect.

Qualitative Data Collection Procedures and Analyses

Qualitative data were collected through separate focus group discussions for each of the stakeholder groups (teacher, parent, and volunteer) at 4 of the program schools. All teachers of grades participating in the SAKG Program were invited to participate in the focus groups. Focus groups were held after school in place of a scheduled staff meeting to ensure maximum attendance. The 4 teacher focus groups each had 5 to 10 participants. Parents and volunteers were invited to participate in separate focus groups via notices in school newsletters and letters distributed by school administration staff. These focus groups therefore were composed of self-selected parents and volunteers who chose to respond to the invitations. Four parent and 4 volunteer focus groups were conducted with participation numbers ranging from 2 (owing to recruitment difficulties at 2 schools) to 13 participants, with occasional mixed membership because some parents were also volunteers. Two children’s focus groups were held at each of the 6 program schools, which resulted in a total of 12 groups, each with 10 to 12 child participants. Teachers were asked to choose children from grades 3 to 6 for these groups, representing a range of experiences with the program from among those for whom consent to participate in the evaluation had already been obtained. Individual interviews were also conducted with each of the 6 program school principals and all 10 specialist kitchen and garden staff from participating schools (Figure).

As is consistent with accepted inductive methods of inquiry for qualitative research, the semi-structured focus group discussions and interview questions were designed to be open-ended, to avoid leading participants toward particular answers. Participants were asked to describe their level of involvement in the program, their expectations, their experiences, and what they believed had been the impact of the program on themselves, on the children, and on the school community. These questions elicited data from all groups of participants relevant to the primary objective concerning the impact of the program on children’s willingness to try new foods. It also provided additional information regarding the social impacts of the program, impact on volunteers, and process information, reported elsewhere. Focus groups, interviews and observations were not planned for comparison schools because at the beginning of the evaluation they had no formal gardening or cooking program to discuss.

Focus groups and interviews were recorded and transcribed verbatim. Transcripts were coded, categorized, and analyzed using inductive thematic analysis to identify emerging themes and patterns, which were then further analyzed according to their relationship to the existing evidence base and theoretical perspectives. QSR NVivo qualitative data analysis software (version 8, QSR International Pty Ltd, Doncaster, Victoria, Australia, 2008) was used as a data management tool for handling the large quantity of data.

A neutral researcher observer also conducted class observation at 4 of the program schools at 3 points over the course of the evaluation. Detailed field notes consisted of observations within program classes and description of children’s attitudes, behaviors, interactions, and conversations relating to their cooking and gardening tasks, and changes in all of these over time. Analysis included the researcher’s reflections on the meanings of what had been
**PROGRAM**

**Enrollment into Program**
Schools with the SAKG Program selected using random sampling methods to ensure representation of geographic location, socioeconomic status and school population size.

**Allocated to Program**
(n = 724)
All children in grades 3-6 received the SAKG Program.

**Recruitment and Baseline**
Consent was obtained and data collected from 475 children and 326 parents (Participation rate: child 65.9%, parent 49.6%).
Children not available for data collection (n = 12). Parent non-response (n = 45).

**Follow-up**
Follow-up data was collected from 360 children and 264 parents (Retention rate: child 76%, parent 56%).
Children lost to follow-up (n = 115)
- 65 no longer attend school
- 9 declined participation
- 16 not available
- 25 no reason provided
Parents lost to follow-up (n = 61)
- 27 no response
- 34 child no longer attends school

**Analysis**
Program analyzed (352 children, 186 parents)
Excluded from analysis due to incomplete data:
Children (n = 8)
Parents (n = 78)

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**COMPARISON**

**Enrollment into Comparison**
Comparison schools selected using random sampling and matched comparison sampling methods to ensure similarity to program sample.

**Allocated to Comparison**
(n = 750)
All children in grades 3-6 exposed to some sort of gardening and/or cooking experience, but not the SAKG method.

**Recruitment and Baseline**
Consent was obtained and data collected from 289 children and 236 parents (Participation rate: child 38.5%, parent 31.5%).
Children not available for data collection (n = 9). Parent non-response (n = 43).

**Follow-up**
Follow-up data was collected from 252 children and 193 parents (Retention rate: child 87%, parent 67%).
Children lost to follow-up (n = 37)
- 26 no longer attend school
- 2 declined participation
- 8 not available
- 1 no reason provided
Parents lost to follow-up (n = 75)
- 38 no response
- 26 child no longer attends school

**Analysis**
Comparison analyzed (240 children, 130 parents)
Excluded from analysis due to incomplete data:
Children (n = 12)
Parents (n = 63)

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**Figure.** Flow diagram of recruitment and data collection procedures for the *Stephanie Alexander Kitchen Garden (SAKG)* Program evaluation.
observed, and their explanations. These data contributed to the evaluation findings related to the primary objectives of willingness to try new foods, and the capacity to describe food and food experiences, as well as to process evaluation findings reported elsewhere.

Quantitative Data Collection Procedures and Analyses

Parent questionnaires included a question about the child’s willingness to try new foods. The child questionnaire extended this to 3 items, which asked about children’s willingness to try new foods if they had (1) never tried it before, (2) cooked it themselves, and (3) grown it themselves. This was modified from a validated scale by Cunningham-Sabo and colleagues. Responses were provided on a 4-point Likert scale, from “never” to “always.” Responses were dichotomized to “always” vs the other 3 categories combined. Dichotomization was necessary here and where noted in the analyses described below, because there were insufficient data in some of the categories to support valid statistical analyses. Parent questionnaires also included demographic questions and questions about dietary intake.

To describe children’s food choices and food descriptions, children were also asked in the child questionnaire to name and describe their favorite “savory” and “fruit and vegetable” foods. The sophistication of children’s food choices was assessed on a 4-point scale according to whether they were takeaway or processed foods, the number of foods listed, and the complexity of ingredients or flavor (1 = takeaway [eg, french fies]; 2 = limited [common food, few ingredients, and simple flavors, eg, pasta]; 3 = basic [more complex flavors and more ingredients, eg, curry chicken]; 4 = sophisticated [complex combinations or less common foods or flavors, eg, quinoa, chicken and coriander salad]). Responses were dichotomized for analyses by combining levels 1 and 2 into a “simple” category and levels 3 and 4 into a “more complex” category. The sophistication of the language children used to describe their favorite foods was assessed according to the clarity, number, and complexity of the descriptions (eg, use of evaluative and descriptive words relating to temperature, color, taste, texture, smell, and emotional impact) and coded on a 4-point scale (1 = unclear [preference only, eg, “yummy”]; 2 = limited [1 dimension, eg, “cold”]; 3 = basic [more than 1 dimension described, eg, “smooth and salty”]; 4 = sophisticated [more than 1 dimension, clear and sophisticated description, eg, contrast between crunchy nuts and a sweet, spicy sauce]). Responses were dichotomized for analysis by combining levels 1 and 2 into a “simple” category and levels 3 and 4 into a “more complex” category.

Outcomes were compared between the program and comparison groups. Demographic and baseline characteristics were summarized using numbers or percentages for categorical variables, and means and standard deviations for quantitative variables. Binary outcomes were compared between study groups using the method of marginal logistic regression models using Generalized Estimating Equations with information sandwich standard error (specifying an exchangeable correlation structure), which allowed for within-school clustering. All analyses were carried out using Stata 10.1 software (release 7.0, Stata Statistical Software, College Station, TX, 2000). Fruit and vegetable consumption data were compared with the 2 servings of fruit and 5 servings of vegetables per day recommended in the Australian Guide to Healthy Eating.

RESULTS

Participants

A total of 26 classroom teachers, all school principals and specialist teachers, 17 volunteers, 20 parents, and 124 children participated in interviews and focus group discussions (Figure). At baseline, child participation rates were 65.9% (n = 475) for program schools and 38.5% (n = 289) for comparison schools, whereas parent participation rates were 49.6% (n = 326) for the program group and 31.5% (n = 236) for the comparison group. Retention rates at follow-up for children were 75.8% (n = 360) and 87.2% (n = 252) (of baseline participants) for program schools and comparison schools, respectively, whereas the parent retention rates were 55.6% (n = 264) for program schools and 66.7% (n = 193) for comparison schools. The number of teachers who participated in the teacher survey was relatively consistent at baseline and follow-up for program (n = 44 vs 45) and comparison schools (n = 31 vs 26). However, many teachers changed roles, and so were not able to be involved in the program and evaluation at both baseline and follow-up. The Figure provides a flow diagram of the sample for each stage of the evaluation.

At baseline, demographic characteristics were similar between the program and comparison groups. Overall, 54% of participating children and 89% of participating parents were female, and children had attended their respective schools for a mean of 4 years. The majority of parent respondents were born in Australia or New Zealand and spoke English at home (Table 1).

Qualitative Findings

The qualitative findings provided an opportunity to capture the perspectives of children, teachers, parents, volunteers, school principals, and kitchen and garden specialist staff about the nature of changes they experienced and observed through being part of the SAKG Program. Four primary themes emerged from the data analysis: children eating and appreciating new foods, the impact of the program on student engagement and learning, the social impacts of the program on the broader school community, and the transfer of program impacts to the home environment. Qualitative data also provided information on processes and implementation of the program as well as participants’ willingness to pay for the program. These latter data arose in response to specific questions designed to inform the economic component of the evaluation. This article reports findings pertaining to the primary objective of the program: its impact on children’s appreciation of and willingness to try new foods.

Children, teachers, parents, volunteers, school principals, and kitchen and garden specialist staff reported
The speed of change has been immense. The way they share, discuss, and try food is the standout point, the willingness—they are never forced—the fact that they know they can try without having to finish everything on their plate is really important...the peer group discussion around that promotes the willingness to “have a go.” They had silver beet today, and the other day, a bright pink beetroot raita without any comment.

Others described how much they enjoyed watching children react and change:

“I had 1 child and he wouldn’t eat the salad, just wouldn’t touch it. “I’m not eating that, it’s leaves!” and then he tried them and thought they were actually quite nice. The week after, he came back and he said, “I made that leaf thingy that we made last week and I made it for my mum and she liked it too.” How good is that!

With few exceptions, children in focus groups reported they were enjoying trying new foods, were more confident in trying new foods, and were now eating a wider range of food than previously. They talked about eating more vegetables in particular. They thought the food they were eating now was healthier, and many also said they were eating less “junk food.” They reported their parents were happy about these changes. Children also discussed how they enjoyed trying foods from different cultures, and mentioned Mediterranean, Asian, and Moroccan as examples. Children often indicated their

in the focus group discussions and interviews that 1 of the most striking things evident since the introduction of the SAKG Program was children’s increased appreciation of and willingness to try new foods. One principal reported how a young boy in a kitchen class had exclaimed in amazement: “This tastes better than Maccas [McDonalds]!”

According to teachers, the program introduced children to new ingredients and tastes, and within a short time almost all children were prepared to at least try a new dish. Teachers at several schools also reported that they had seen a noticeable improvement in the nutritional quality of the food that children had been bringing to school for snacks and lunches since the program had been introduced.

Teachers described feedback from parents about how much more adventurous the children had become with both food and cooking. One teacher described a mother’s reaction as follows:

She was really surprised. Just last week she was in the kitchen helping and she is in raptures that the kids just sit down and eat all of these green, leafy vegetables and enjoy their salads …

Comments from parents and volunteers in focus groups agreed that children had become more willing to try new foods and showed more awareness of issues of health and nutrition. Children were reported to be willing to try new dishes and were making healthier choices and consuming more vegetables and fruits. In some cases, the changes were reported to be dramatic. One parent reported that her child, who had previously been reluctant to eat vegetables, would now happily help prepare vegetable soup and discuss all the vegetables in it while enjoying it. One parent volunteer who spent 2 sessions a week in the kitchen elaborated on why the program had made such a difference:

| Table 1. Baseline Characteristics for Program and Comparison Groups |
|-----------------|-----------------|-----------------|
|                 | Program Schools | Comparison Schools |
| **School characteristics** |                  |                  |
| School sample (n) | 6               | 6               |
| Geographic location of schools |                  |                  |
| Metropolitan     | 3               | 3               |
| Rural/regional   | 3               | 3               |
| Socioeconomic status |                  |                  |
| Medium-high      | 3               | 3               |
| Low              | 3               | 3               |
| Size of school (number of students) |                  |                  |
| Medium-high (> 200) | 4               | 4               |
| Low (≤ 200)      | 2               | 2               |
| Duration between baseline and follow-up, mo (mean [SD]; range) | 17.1 (4.6); 12–25.5 | 9.7 (1.6); 6–11 |
| **Child characteristics** |                  |                  |
| Participating students (n) | 463             | 280             |
| Female (%)       | 51.6            | 55.7            |
| Grade            |                  |                  |
| Grade 3 (%)      | 35.1            | 23.6            |
| Grade 4 (%)      | 34.3            | 35.4            |
| Grade 5 (%)      | 30.6            | 23.6            |
| Grade 6 (%)      | 0               | 17.5            |
| Years at school (mean [SD]; range) | 3.9 (1.6); 0–6.5 | 4.1 (1.7); 0–7.5 |
| **Parent characteristics** |                  |                  |
| Participating parents (n) | 281             | 193             |
| Female (%)       | 89.3            | 88.1            |
| Parent education level |                  |                  |
| Completed ≤ 10 y (%) | 13.6            | 17.6            |
| Completed 11–12 y or technical qualification (%) | 41.9            | 33.0            |
| Completed university degree (%) | 36.8            | 42.0            |
| Other (%)        | 7.7             | 7.5             |
| Parents’ country of birth: Australia or New Zealand (%) | 84.2            | 84.4            |
| Main language spoken at home: English (%) | 96.8            | 94.8            |
appreciation of the fact the food they grew was organic. The children also commented that they could taste “the freshness” and the fruits and vegetables tasted better than those from the supermarket.

Many of the children stressed that changes to their eating habits had occurred since they had begun participating in the program. Children reported they were not only eating new foods, they were also enjoying the experience: “It was fun eating all of the new foods;” “I just like to know that you’re eating your own stuff that you’ve been growing and to be able to try new things that you’ve never tried before …”

The class observation sessions also demonstrated that most children were willing to try all of the new foods. Only 1 child was observed to eat nothing and only a handful would bypass even 1 item of food. In the initial round of class observations, teachers and volunteers were overheard urging the children to taste the food. By the third round of class observations (roughly a year later), no such urging was heard; there was no need, because children who did not try the food were clearly the exception. It was interesting to observe during this last round of observations that at 1 school, the children at the table asked the adult sitting with them why 1 child did not taste the food.

In contrast, the program appeared to have little impact on children’s capacity to describe foods, despite observation of class exercises and specific education about language to describe tastes, textures, and smells. The children tended to use simple words such as “beautiful,” “nice,” and “yummy.” Chocolate tasted “chocolaty,” ice cream was “cold,” and spaghetti was “stringy.”

Quantitative Findings

At follow-up, adjusting for baseline and grade, children’s reports showed increased odds of willingness to try new foods if they had never tried it (odds ratio [OR] 1.95, 95% confidence interval [CI]: 1.06–3.58, P = .03), had cooked it (OR 2.37, 95% CI: 1.45–3.90, P = .001), and had grown it (OR 2.25, 95% CI: 1.47–3.47, P < .001) (Table 2). Parent questionnaire data did not show evidence of a difference between the program and comparison groups regarding whether children were “always” willing to try new foods (OR 1.69, 95% CI: 0.93–3.09, P = .09) (Table 2).

There was little evidence that the SAKG Program was associated with an increase in the capacity of children to describe foods, or in the proportion of children reported by parents to be meeting consumption guidelines for fruit, vegetable, and soft drink consumption (Table 2). Questionnaire results showed that whereas over 70% of children from both program and comparison groups were eating 2 servings of fruit at both baseline and follow-up, fewer than 10% were eating 5 servings of vegetables per day at either baseline or follow-up (Table 2).

DISCUSSION

Children’s increased willingness to try new foods emerged as a dominant theme in all of the interviews, focus group discussions, and class observations from the program schools. Statistical evidence in the child-reported data of this program effect supported these qualitative findings and showed that the odds of reporting they were always willing to try new foods was around twice as great for children in the program group compared with the comparison group. Cooking and then sharing the meals was a core and therefore recurring feature of the kitchen classes. However, the variety of the weekly menus meant that the children were being exposed to a wide diversity of foods, rather than repeat tastings of the same food, which Birch and colleagues44 recommended as an essential component of interventions to increase willingness to try new foods. Teacher and volunteer qualitative data and class observations instead suggest that the social environment of the class increased children’s willingness to try new foods. This included sitting down together to share and enjoy the meal that they had prepared, with encouragement to taste but no pressure to eat. This supports Birch and colleagues’ suggestion that social environments may also have a role in shaping this behavior. It is also consistent with the principles of ecological theory and health promotion in terms of the interdependence between individuals’ health behaviors and their physical and social environment.31,35

The quantitative evaluation measures also supported this finding, which showed evidence of differences between children from program schools and comparison schools in child-reported willingness to try new foods, especially if they had grown or cooked it themselves. This proximal effect of the school garden replicates Ozer’s34 model of the proximal and distal effects of school gardens, and is consistent with previous research24 indicating a positive correlation among children between planting and harvesting vegetables and an increase in their willingness to taste them. The difference between program and comparison schools’ baseline child reports for willingness to try new food may reflect the fact that children in some program schools had just started participating in program activities at the time of baseline data collection. These baseline differences were adjusted for in the analyses.

In contrast to the child questionnaires, parent questionnaire findings on whether children were “always” willing to try new foods showed little evidence of a true difference between the program and comparison groups. Both qualitative4,25 and quantitative3 evidence of this effect has been documented in previous studies of edible gardens. The measure in the parent questionnaire was simplified compared with the child questionnaire. It did not account for when children had grown or prepared the food. Therefore, it may not have had the sensitivity to reflect changes arising from the program.

Teachers, parents, volunteers, and children reported in focus groups and interviews that they noticed a change in children’s attitude toward and
consumption of vegetables after the introduction of the SAKG Program, but the parent questionnaire results did not reflect these changes. Previous studies indicate a perceived increase in daily vegetable consumption, based on child participant survey results, 45,46 24-hour recall records, 23 and lunchroom observations. 47 However, some researchers have noted that there is limited evidence of nutritional behavioral changes as a result of edible and kitchen garden programs. 24 The strong qualitative findings in the SAKG Program evaluation may have occurred because the changes reported qualitatively reflected the more dramatic changes affecting the subgroup of children who initially showed greater reluctance to try new foods, rather than changes at the population level. This may mean that the program effect lies more in reducing inequities than in overall population shift. It may also be because the observed changes were still occurring mostly within the school environment in the context of the SAKG Program, and the home environment was offering only limited opportunities for children to demonstrate their willingness to try new foods. Further research is required to explore whether the impact of the program extended to the home environment. The qualitative findings may also reflect the beginning of a change and may become more evident over time. One study suggests that far fewer hours of nutrition education are required to change participants’ health knowledge (about 15 hours) relative to the time requisite to alter health behavior (about 50 hours). 48 Therefore, other changes such as increased healthy eating are more likely to become evident over a longer period of exposure to the program. The qualitative finding that children appreciated the freshness of fruit and vegetables, as well as that they were grown organically, is consistent with that of Somerset and Markwell, 45 who found evidence of an increase in the number of students (grades 4 and 6) who reported that edible garden produce tasted better than store-bought alternatives. Such reports may indicate an enhanced engagement, awareness, and appreciation of the fruit and vegetables that participants grow, cook, and eat.

| Table 2. Results of Outcomes at Baseline and Follow-up and Adjusted Differences between Program and Comparison at Follow-up |
|-----------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                                   | Baseline       | Follow-up       | Unadjusted OR | Adjusted OR    | 95% CI         | P              | ICC            |                |
|                                   | Program (%)    | Program (%)     | Program (%)   | Program (%)    | Program (%)    | Program (%)   | Program (%)   | Program (%)   |
| Outcome 1.1: Willingness to try foods |                 |                 |                |                |                |                |                |                |
| Child will always try a new food if has: | 29.8 463 25.3 277 35.4 353 24.0 245 | 2.05 1.95 1.06-3.58 | .03* 0.034 |
| Never tried it before               | 23.9 280 23.8 193 34.2 260 25.8 158 | 1.50 1.69 0.93-3.09 | .09 0          |
| Cooked it                          | 33.4 458 25.1 275 38.7 351 22.9 244 | 2.10 2.25 1.47-3.47 | < .001* 0.014 |
| Grown it                           |                 |                 |                |                |                |                |                |                |
| Parent report that child always willing to try new foods | 22.3 440 23.6 274 35.3 351 26.2 244 | 0.80 0.98 0.44-2.15 | .95 0.086 |
| Outcome 1.2: Food choices and food descriptions |                 |                 |                |                |                |                |                |                |
| Child provides “more complex” description of favorite savory food | 9.4 451 10.8 278 56.9 347 53.1 240 | 0.99 1.11 0.46-2.65 | .78 0.085 |
| Child provides “more complex” description of favorite fruit/vegetable | 6.0 404 6.3 279 13.6 344 10.4 226 | 1.08 1.31 0.46-3.78 | .62 0.457 |
| Child reports more complex favorite savory food | 16.3 442 18.8 278 22.8 355 19.7 244 | 1.13 1.40 0.75-2.61 | .29 0.037 |
| Child reports “more complex” favorite fruit/vegetable | 19.6 440 23.6 274 53.0 351 56.2 244 | 0.80 0.98 0.44-2.15 | .95 0.086 |
| Outcome 1.3: Food and beverage intakes |                 |                 |                |                |                |                |                |                |
| Child eats at least 2 servings of fruit/d | 84.2 268 74.6 189 79.8 255 72.5 155 | 1.50 1.68 0.90-3.14 | .11 0          |
| Child eats at least 5 servings of vegetables/d | 7.7 273 5.9 189 7.3 256 9.5 153 | 0.75 0.87 0.54-1.42 | .59 0          |
| Child drinks no sweet drinks/d | 74.1 275 76.2 188 75.6 251 68.1 158 | 1.76 1.33 0.70-2.5 | .38 0.073 |

CI indicates confidence interval; ICC, intra-cluster correlation coefficient; OR, odds ratio. *P < .05 is considered significant. P refers to the comparison between the program group and the comparison group at follow up in analyses that are unadjusted and then adjusted for baseline outcome scores and grade and school clustering.
consume. Ultimately, this may shift their preferences to homegrown or locally grown organic fruit and vegetables if they are accessible in the home environment.

The lack of evidence of a difference between program and comparison groups in children’s capacity to describe foods suggests that the capacity increases with age, in line with increasing cognitive and language ability, and is not affected by the SAKG Program. These findings demonstrate the importance of comparative evaluation to ensure that changes that occur naturally are not attributed to the intervention.

Several limitations exist within this study. This study was not a randomized, controlled trial (RCT). Based on the findings of this comparative study, an RCT is recommended to confirm or refute the results of this study.

Enthusiasm in the program schools for the SAKG Program associated with the celebrity factor of Stephanie Alexander’s involvement may have increased recruitment and resulted in a potential bias in responses. In contrast, some teachers and parents reported that they were initially concerned that the program would take time away from academic subjects. However, they found that the program actually supported children’s personal and academic development.

Only schools that had established their own edible gardens, or were in the process of doing so, agreed to participate as comparison schools. In addition, 1 comparison school moved from using its garden produce for occasional cooking to developing its own more structured cooking program over the course of the evaluation. This means that the evaluation needed to establish the impact of the SAKG Program was greater than any alternative program being conducted in comparison schools. The delay in recruiting comparison schools reduced the duration between baseline and follow-up data collection, and resulted in program schools having an average of 7 months more before follow-up assessment. Because children’s developmental advances could also have been responsible for the improvement seen in program schools, this discrepancy was adjusted for in the analysis.

There could also be a participant recruitment bias in the study, especially the qualitative aspects, because those with more positive comments may be more likely to participate. Potential sources of bias of parent-reported child food records include those related to social desirability, serving size estimation, and parental recall of the child’s diet. However, it is anticipated that the level of any of these potential biases would be similar between the program and comparison groups. As such, although the amounts reported may not be completely accurate, the analysis of the differences between the groups should be valid.

**IMPLICATIONS FOR RESEARCH AND PRACTICE**

The strength of the findings in terms of children’s increased willingness to try new foods provides preliminary evidence of the success of the SAKG Program in achieving its primary objective, and is consistent with relevant theoretical frameworks and the existing limited evidence base. Nevertheless, the link between increased willingness to try new foods and increased fruit and vegetable intake is inconclusive. Although changed dietary intake is not an aim of the SAKG Program, the seriousness of the current prevalence of child overweight and obesity and the success of the program in increasing children’s willingness to try new foods merit further investigation of the program using an RCT as the program is extended to schools throughout Australia and to the United Kingdom, to explore its impact on changed dietary intake over time.

**REFERENCES**

4. Lautenschlager L, Smith C. Beliefs, knowledge, and values held by inner-city youth about gardening, nutrition, and cooking. *Agriculture and Human Values*. 2007;24:245-258.


